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children. I would not say that all these existed in Oregon and Washington in prehistoric times, nor that the Indian artist had travelled around the world, but that all these things had come to him.

We have an excellent bust of Mr. Cleveland made by an Indian from a scrap of *Harper's Weekly*, which one of our collectors had wrapped around a bundle. It is not at all unlikely that the portraits of Mr. Crowley had found their way to Oregon in the same manner. It was a very popular subject about the time of his death, and the papers were full of him.

However, I am very far from depreciating the specimens on that account. The manner in which the lines of our culture move forward into savage culture is the most important inquiry in the history of civilization.

O. T. MASON.

U. S. National Museum, Feb. 28.

BOOK-REVIEWS.

Mineral Physiology and Physiography. By T. STERRY HUNT. 2d ed. New York, Scientific Publ. Co. 8°. \$5.

A New Basis for Chemistry; A Chemical Philosophy. By T. STERRY HUNT. 3d ed. New York, Scientific Publ. Co. 12°. \$2.

Chemical and Geological Essays. By T. STERRY HUNT. 3d ed. New York, Scientific Publ. Co. 8°. \$2.50.

Systematic Mineralogy, based on a Natural Classification. By T. STERRY HUNT. New York, Scientific Publ. Co. (In press.)

THE new and revised edition of the works of the veteran scientist, Dr. T. Sterry Hunt, calls for renewed attention to the great world problems to which he has devoted a long and studious life. Those problems have arisen in the attempts of science to ascertain the ultimate, or at least a truer, conception of matter, and to obtain some theory of the formation of the chemical elements, and then of their combination and order in the formation of the sun, solar system, and especially of our earth. Dr. Hunt, at the close of his "Physiography," calls it "mineralogical evolution," and from it he proposes a new mineralogical classification and nomenclature, and finally "A New Basis for Chemistry."

Those who are not acquainted with the scientific career of the author may at first suppose that an attempt of this adventurous kind belongs to sensational and pseudo-scientific romancing excited by presumption, sentiment, ignorance, and imagination. Far other is the result of a careful examination of these volumes. We find in them a patient, mature, and thoroughly trained physicist, drawing to a conclusion, which he verily believes to be triumphant, the scientific evidence by which he has worked out not only this dream of his own youth, but the dream of the youth of Science herself: for the first question Science had to propose in early Greece, and the last she may have to solve, is the nature of matter and its changes. Her work is all there. How far the solution has progressed is disclosed in an exceedingly instructive history of previous efforts in that regard, made introductory to his own, in Dr. Hunt's main work, "Mineral Physiology and Physiography." This work should be the first taken in hand by the student, and then the "New Basis of Chemistry," and lastly, and by way of greater illustration, "The Essays" and "Systematic Mineralogy." This suggestion may save some disappointment, for Dr. Hunt has little mercy for those not acquainted with scientific methods and terminology. But when taken in the right order, as above indicated, this difficulty gradually disappears. The interest in the subject, than which none can be more sublime or important, fully repays the labor required to master its technicalities.

There are few scientists who are competent to give opinions of weight upon these fundamental questions, but none can be indifferent to them. To compare these great matters with small, we may say that Dr. Hunt has attempted to do for the mighty universe of inorganic matter what Darwin and the modern biologists have done for the little organic world of protoplasm. It is singular that we have been led to chiefly think this little organic world to be complex and inexplicable when compared with physics and chemistry; but the fact seems to be that during this cen-

tury the organic world has been pretty well made out. Given protoplasm as found in nature, and the laws of growth and environment, and evolution tells the rest of the organic story — except to people who seem to have some reason for not wishing to have the "mystery" solved. So much having been accomplished as to organized matter, Dr. Hunt's works bring forward anew the very timely question, "Is there also one universal substance which, in its knowable changes and combinations, can give us the solution of the vast material world?" The contrast with the organized matter may be used only to state the question; for their methods must be quite disparate, and should never be confounded. Dr. Hunt answers this question affirmatively. He begins with the hypothesis of Newton and his successors, that the universe as far as known is a *plenum* of ether, and from the properties of light, heat, electricity, chemical affinity, etc., infers its reality. From astronomical and spectroscopic data he infers that the nebulae from whence sun systems result are ethereal condensations. "Thus, perhaps," says Newton, "all things may be originated from ether;" and we are gradually brought to see this hypothesis gather the strength of a true theory under the light of the latest discoveries.

The author carefully lays away the atomic theory as unscientific, and the source of the principal misunderstandings of nature. The counter theory of the ultimate continuity of matter is then brought forward as the basis of the new philosophy by which only the ether theory of Newton (contrary to his own view) can be sustained. We then are taught that "all chemical union is nothing else than solution;" the uniting species or forms of matter are simply dissolved in each other. Chemical union is the identification of the combining bodies in volume and character in the new species formed. The type of the chemical process is found in solution, from which it is possible, under changed physical conditions, to regenerate the original species. All of these "may be supposed to be formed from a single element, or *materia prima*, by the chemical process." The "New Basis for Chemistry" (pp. 16-22, 35-37, *et passim*) elaborates this view. In the third chapter we are introduced to the *materia prima*, from which, by a process of cooling and electric changes, the chemical elements result by a process of "successive polymerization." Matter in its simple form, which must be far beyond the tenuity of hydrogen, can only be looked for by the spectroscope under the inconceivable heat of the grander suns. The author evidently believes that the later observations indicate forms of a primal matter, which, under heat and electrical changes beyond our present intelligence, polymerizes, and appears to us first as chemical elements, and hence as gases, and thence, as polymers of gases arise, under decreasing heat, as liquids, colloids, and solids.

From this vantage-ground the author has the basis of a new law of numbers, weights, volumes, densities, etc., — in a word, a new chemistry. By its light the combinations of matter are reviewed from the experiments of the laboratory to the mighty changes of stellar nebulae. The stratified "rock-ribbed" bones of our planet are accounted for by an order determined by the nature of the materials, their chemical union, and modes of condensation.

The author takes unmeasured pains to work mineralogy and geology into orderly sciences by showing how the granitic rocks were chemically formed, and then forced to the surface and into the solid forms in which they now appear by "crenitic" or spring-like action. Thus we have a rational, uniform, chemical, account of our sun's and of our earth's formation and history. The chaotic appearances on the earth's surface are not evidences of catastrophes, but the results of the condensation of matter, and the crenitic and other re-arrangements which that process necessarily compelled. Thus we are made to conceive of ethereal, gaseous, liquid, colloid, and solid matter as one infinite polymeric world-forming, never-ending drama.

In order to realize this vastly improved science of matter, our author shows that much of the scaffolding which has served well in the past building of such a science now really prevents its completion. He especially shows that the atomic hypothesis, the present chemical notation, and classification, and the treatment of mineralogy, are not true, or but partly so, and should be replaced by the completed theory of matter and its polymeric changes and

combinations as a continuous history. All of this daring proposal leads, of course, to a scientific revolution similar to that accomplished by Lamarck, Darwin, and Haeckel in biology. And this, we have to keep recalling, is not the work of a tyro, but of a *savant* recognized and honored as such in the front rank of physicists the world over. We grant that only those in that rank, and gifted also with rare powers of generalization, can competently weigh the evidence and appreciate the theory which the industry of a long life has presented in these volumes. It is a theory which certainly must wait for final completion; but as a working hypothesis, in the absence of any other, it is a unitizing, completing scheme of nature, invaluable as a suggesting power, and as a centre around which the results of scientific observation and experiment may be intelligently gathered, and then held as parts of one mighty world drama. It may be further said, that, however the author may come short of present sufficient evidence of his hypothesis, he has rendered very dubious, if not wholly untenable, the old notions of matter, and of all chemistry based upon the atomic hypothesis. Hereafter we are to have neither an atom nor a vacuum, but a continuous world of continuous matter, with all of its world creative changes and combinations accounted for by a continuous law formulated in a nomenclature expressive of that unity. The realization of this dream of Newton, Huygens, Young, and their many patient followers, of whom our author is one, would certainly be the crowning glory of our race. To date the solution of both the vital and the material worlds in the same century

would seem to be pressing Father Time too rashly of late; and he may properly leave us to evolve through another century before we reach the sufficient evidences of the true theory of ether and matter, suns and worlds.

T. B. WAKEMAN.

AMONG THE PUBLISHERS.

A COMPREHENSIVE life of Gen. Sherman is about to be published and sold through agents by Hubbard Brothers of Philadelphia.

— John Wiley & Sons announce as in preparation "Ordnance and Gunnery," by Capt. Henry Metcalfe, U.S.A.

— Macmillan & Co. have just published "The Fossil Insects of North America, with Notes on some European Species," by Dr. Samuel H. Scudder. The work is in two volumes, with sixty-three plates and numerous illustrations in the text. These volumes, of which only one hundred copies are issued, form the most extensive work of the kind ever published. Over eight hundred and fifty species are described, most of them being figured on the lithographic plates. The descriptions include, with two or three exceptions, all the fossil insects ever described from North America, besides a large number now first published. Besides the merely descriptive matter, the general student will find essays on the classification, distribution, and geological sequence of the different groups. The term "insects" has been used in a broad sense to include myriapods and arachnids, as well as hexapods, or true insects.

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